

# Arthroscopic Posterior Shoulder Stabilization With an Iliac Bone Graft and Capsular Repair: A Novel Technique

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**Abstract:** Several surgical approaches have been described for the treatment of recurrent posterior shoulder instability. Many authors have performed posterior bone block procedures with good results not only in the presence of glenoid bone loss or dysplasia but also in the case of capsular hyperlaxity and poor soft-tissue quality. Open techniques often require an extensive approach with the disadvantage of a poor cosmetic result and possible insufficiency of the deltoid muscle. Furthermore, the treatment of concomitant pathologies and the correct placement of the bone graft are difficult. Therefore we describe an all-arthroscopic posterior shoulder stabilization technique with an iliac bone graft and capsular repair that is intended to improve the pre-existing open procedure. The key steps of the operation are the precise placement and screw fixation of the bone block at the posterior glenoid under arthroscopic control and the subsequent posterior capsular refixation and plication using 2 suture anchors to create an extra-articular graft position.

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Various surgical techniques have been previously described for the treatment of recurrent posterior shoulder instability.<sup>1,2</sup> Commonly, soft-tissue reconstructions are performed in the case of capsulolabral lesions and normal bony anatomy, but especially in the presence of traumatic posterior bony Bankart lesions, glenoid erosion, or posterior glenoid dysplasia, open bone grafting techniques have been reported<sup>3-7</sup> (Fig 1, Table 1). Even in the absence of osseous deficiency, many authors have performed posterior bone block procedures to reduce the high rate of recurrent instability reported after soft-tissue re-

pairs.<sup>3-5</sup> In such cases, the bone graft is intended to extend the glenoid surface rather than to act as an anatomic repair. Recently, biomechanical studies have shown reduced posterior and posteroinferior translation of the humeral head after a posterior bone block procedure, and the importance of the posterior Bankart repair was shown regarding the re-establishment of inferior joint stability.<sup>8</sup>

The previously reported open posterior bone block techniques require an extensive approach with the disadvantage of a poor cosmetic result and the possibility of postoperative partial deltoid muscle insufficiency.<sup>4,7</sup> Furthermore, the correct placement of the osseous graft and the treatment of concomitant pathologies such as reverse Hill-Sachs lesions, as well as SLAP and anterior labral tears, can be very challenging or even impossible through a single open approach.

We describe a new arthroscopic technique that is intended to improve the accuracy of bone graft placement, the quality of soft-tissue repair, and the treatment options for concomitant pathologies. Further benefits are the consequential advantages of minimally invasive surgery, such as easier rehabilitation, faster return to sports, and good cosmetic results.

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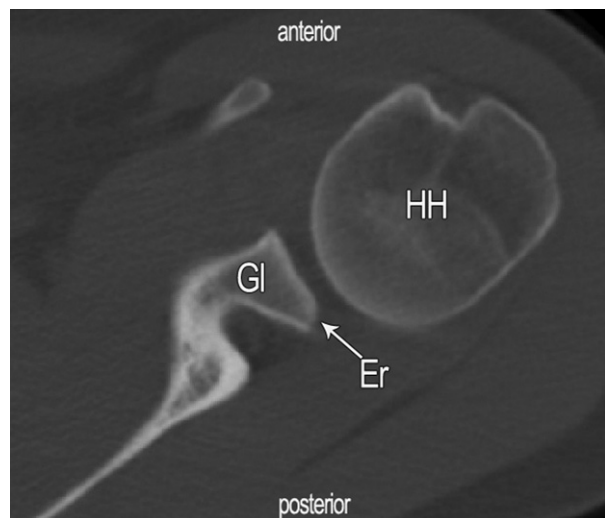
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**FIGURE 1.** Axial computed tomography image of a left shoulder with posterior glenoid erosion (Er). (Gl, glenoid; HH, humeral head.)

## TECHNIQUE

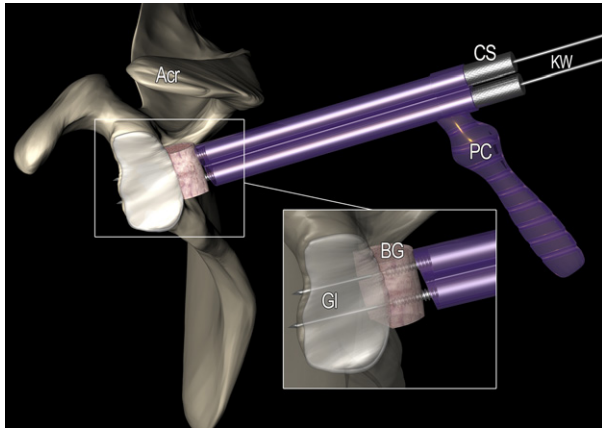
Under general anesthesia and with a routine antibiotic regimen, the patient is placed in the beach-chair position. After dynamic stability assessment of the shoulder, a pneumatic arm-holding device (Orion Surgical, Hamburg, Germany) is used to control antero-lateral traction and rotation during the procedure. A standard posterior viewing portal is created in the “soft spot,” and a 30° arthroscope is introduced into the joint. Next, an anterior portal is established in the rotator interval, and a cannula is inserted. The joint is inspected for intra-articular pathologies such as lesions of the labrum, capsule, biceps tendon, rotator cuff, cartilage, and bony structures. To improve the view of the posterior shoulder, a small anterolateral portal is created just anterior to the supraspinatus tendon in an outside-in technique and the arthroscope is placed here by use of a Wissinger rod. In case of a large labral lesion and intact capsule, a standard posterior Bankart repair with suture anchors without bone grafting can be performed. If the anticipated constellation of a weak and elongated posterior capsule with or without a posterior glenoid defect or dysplasia is confirmed, the capsule is opened vertically along the posterior glenoid rim with a radiofrequency device (VAPR; DePuy Mitek, Raynham, MA) while leaving the labrum in place. Now, a 70° arthroscope is used to improve the visualization of the posterior glenoid area. The posterior scapular neck is prepared with a radiofrequency device while caution is taken to pre-

serve the suprascapular nerve. Next, a 5-mm burr is introduced, coming from posterior, and the scapular neck is abraded until a smooth bleeding bony surface is created with a length of 2.5 to 3 cm and a width of 1 to 1.5 cm depending on the size of the patient. Posterior bony Bankart fragments will be removed at this stage. The posterior skin incision is then extended to 2 to 3 cm, and a horizontal split between the infraspinatus and teres minor muscle is created with a radiofrequency device at the level of the equator of the scapular neck; the passage through the deltoid muscle can be bluntly widened with the surgeon’s index finger.

The tricortical bone graft is harvested from the ipsilateral anterior iliac crest. After a 4-cm skin incision and split of the subcutaneous tissue, the inserting muscles are dissected from the iliac crest and a 2.5- to 3-cm bone is marked with a fine tip cautery while keeping a minimum safety distance of 4 cm to the anterior superior iliac spine. Next, the graft is harvested with an oscillating saw and is prepared on a back table. The wound is closed in a standard fashion. The tricortical graft is trimmed to a size of  $2.5\text{--}3 \times 1 \times 1$  cm, and the cancellous surface is cut at a slightly oblique angle to match the shape of the posterior glenoid neck so that, finally, the bone graft acts as an extension of the glenoid surface. The following surgical steps are performed with instruments that were developed and described by Lafosse and Boyle<sup>9</sup> for the open and arthroscopic coracoid transfer and bone block procedures (Bristow-Latarjet Shoulder Instability System; DePuy Mitek). First, two 1.5-mm parallel Kirschner wires are inserted through the former superior cortex of the iliac bone graft with a specific drill guide (coracoid drill guide) so that the tips protrude the angled cancellous surface. Then, the guide is removed and both K-wires are overdrilled with a step drill. After removal of the K-wires and the drill, the holes are tapped and prepared for the top hat and glenoid screws. In case of soft bone, the top hats are screwed into the drill holes to prevent graft fracturing during the transfer. To gain rigid control of the bone graft, it is reduced onto the positioning device by

**TABLE 1.** Indications

Posterior instability with bony Bankart lesion
Posterior instability with posterior glenoid erosion
Posterior instability with elongated, weak posterior capsule and insufficient labrum
Posterior instability with posterior glenoid dysplasia
Posterior instability with failed previous capsulolabral surgery

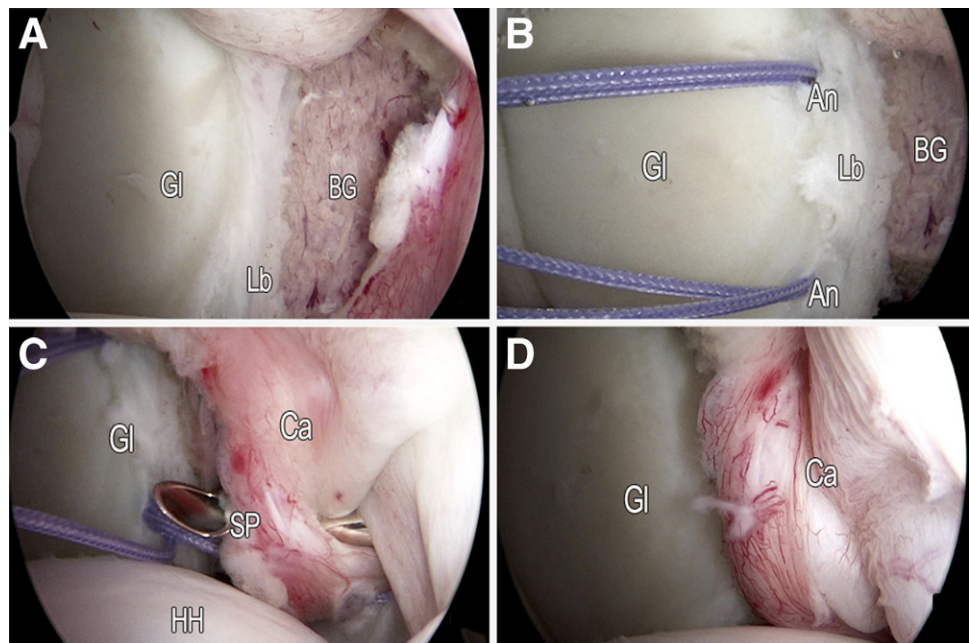


**FIGURE 2.** Three-dimensional diagram of a left scapula. The bone graft (BG) is fixed to the posterior glenoid (GI) with 2 parallel K-wires (KW). (Acr, acromion; CS, cannulated 3.5-mm screws; PC, positioning cannula.)

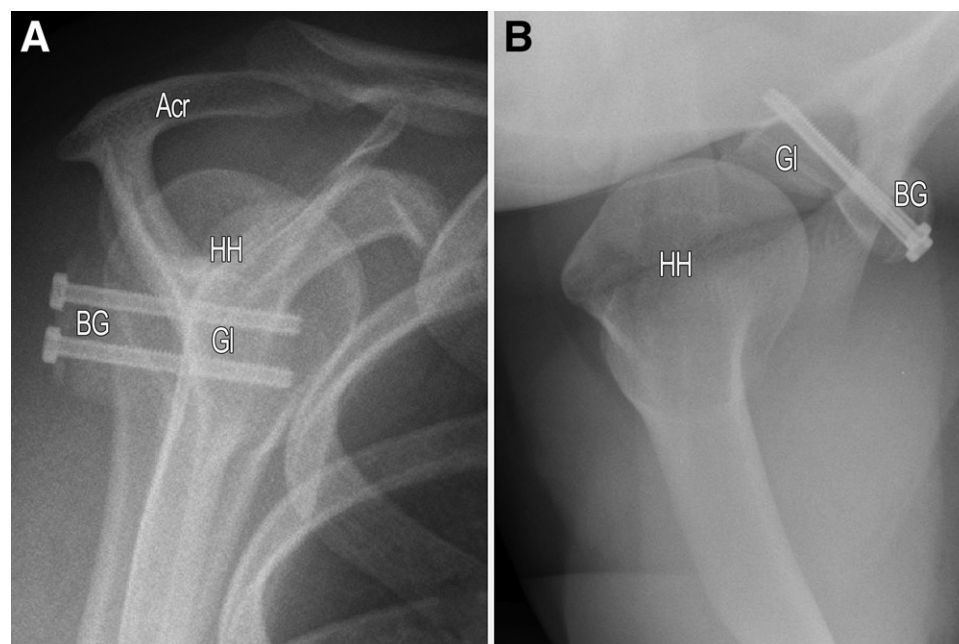
screwing in 2 cannulated 3.5-mm screws. Now, the graft is ready for transfer and fixation to the glenoid. For optimal visualization of the posterior glenoid neck, the 70° arthroscope is introduced in the glenohumeral joint through the anterolateral portal. To ensure the correct size of the soft-tissue passage to the intended graft location, a large metal trocar is inserted through the posterior portal. Then, the graft is manipulated to the posterior glenoid neck with the positioning cannula. The lateral surface of the iliac crest graft

is exactly aligned with the posterior glenoid rim to achieve an extension of the glenoid surface. At this point, the anterior insertion of a switching stick across the joint plane can facilitate graft positioning. Once the graft is sited on the glenoid neck in the desired position, the fixation is undertaken with 2 long 2.5-mm K-wires that are inserted through the positioning cannula, passing the graft and then the glenoid (Fig 2). The inferior screw is removed, the 3.2-mm glenoid drill is passed over the K-wire, and the drill is cautiously advanced to the anterior cortex. The length of the definitive screw can be read from the depth gauge on the drill (usually 34 to 38 mm). After the drill is removed, the surgeon inserts the 3.5-mm inferior screw while leaving the K-wire in place. Then, the same steps are repeated with the superior screw. Afterward, the K-wires and the cannula are removed, and the screws are alternately tightened to compress the graft on the scapular neck. Finally, the graft and screw position are checked, and trimming can be performed with a burr if required. Now, the posteroinferior capsule is reattached and plicated to the posterior glenoid and labrum (Fig 3). Two pilot holes are drilled at the glenoid rim superior and inferior to the bone block, coming through a small posterolateral portal, which is established in an outside-in technique. Then, two 3-mm absorbable suture anchors (Gryphon-BR; DePuy Mitek) are inserted, and the sutures are delivered through the capsule with a 45° curved suture passer. Depending on

**FIGURE 3.** Arthroscopic images of a left shoulder with the patient in the beach-chair position with the 70° arthroscope viewing from the anterolateral portal. (A) Bone graft (BG) placed at posterior glenoid (GI). (Lb, labrum.) (B) Two single-loaded suture anchors (An) positioned superior and inferior to bone graft (BG) in posterior glenoid rim (GI). (Lb, labrum.) (C) Plicating suture delivery through capsule (Ca) with curved suture passer (SP). (GI, glenoid; HH, humeral head.) (D) Final result of posterior capsular plication after knot tying. (GI, glenoid; Ca, capsule.)







**FIGURE 4.** Radiographic images of a left shoulder, 3 months after posterior shoulder stabilization with a bone graft (BG). (A) Lateral scapula view (Y-view). (Acr, acromion; Gl, glenoid; HH, humeral head.) (B) Axial view. (Gl, glenoid; HH, humeral head.)

the degree of hyperlaxity, the capsule is perforated twice in a distance of 1 to 1.5 cm, creating a plication. With the arm in neutral rotation, the sutures are tied from the posterior portal so that the iliac bone graft becomes an extra-articular structure. The skin incisions are closed in a standard fashion. The final radiographic result can be seen in Fig 4, and a technical Video 1 (available at [www.arthroscopyjournal.org](http://www.arthroscopyjournal.org)) demonstrates the technique. Table 2 lists the key points of the procedure.

**TABLE 2.** Key Points

Patient in beach-chair position
Portal placement: posterior, anterior, anterolateral, posterolateral
Inspection of intra-articular structures
Vertical incision of posterior capsule with electrocautery device
Preparation of posterior scapular neck with burr
Horizontal split between infraspinatus and teres minor with electrocautery device
Harvest of bone graft at anterior iliac crest
Preparation of bone graft and fixation on positioning device
Bone graft placement on posterior scapular neck as extension of glenoid surface
Temporary graft fixation with K-wires
Final graft fixation with cannulated 3.5-mm screws
Insertion of 2 suture anchors superior and inferior to bone graft
Suture delivery through posterior capsule with curved suture passer
Knot tying and wound closure

## REHABILITATION PROTOCOL

After surgery, the shoulder is immobilized in a brace in neutral rotation for 6 weeks. During this period, only passive exercises up to 60° of abduction and forward flexion are allowed. From 6 weeks on, full range of motion is developed stepwise, starting with passive, then assistive, and finally, active, with strengthening of the rotator cuff and deltoid muscle. Stretching of the posterior capsule by internal rotation is avoided during the first 2 months. Finally, after 12 weeks, a return to sports is allowed.

## DISCUSSION

Several surgical approaches have been described for the treatment of recurrent posterior shoulder instability.<sup>1,2</sup> The posterior Bankart procedure with reinsertion of the dorsal labrum and capsular shift has been effective in post-traumatic cases without hyperlaxity, as well as in cases of recurrent posterior subluxation.<sup>10</sup> Fronek et al.<sup>6</sup> reported a 91% success rate after posterior shoulder stabilization in a series of 11 patients treated with open capsulorrhaphy. In 5 of 11 cases, because of an insufficient capsuloligamentous complex, additive stabilization was achieved by placement of a posterior bone graft. Barbier et al.<sup>4</sup> published a case series of 8 patients treated successfully with posterior bone block transfer; after 34 months, no instability or degenerative changes were ob-

served. Servien et al.<sup>5</sup> reported on 21 patients with a follow-up of 6 years after posterior bone block treatment, with a low recurrence rate and subjectively good and excellent results.

At our institution, we have performed open posterior bone block procedures for a series of 15 patients with recurrent posterior instability and capsular hyperlaxity and noted only 1 case of recurrent instability after bone block resorption at a mean follow-up of 4 years. Otherwise, no complications or glenohumeral arthritis occurred, and the patient satisfaction rate was high (T.S., unpublished data, May 2012). To improve the accuracy of bone graft placement and capsuloligamentous surgery, as well as to facilitate treatment options for concomitant pathologies, we applied the described arthroscopic technique in 8 cases during the past year and have seen very favorable results with consequential advantages of minimally invasive surgery, such as easier rehabilitation, faster return to sports, and good cosmetic results.

In conclusion, the new all-arthroscopic bone grafting procedure with capsular plication allows a very precise reconstruction in the case of posterior shoulder instability and has shown promising early clinical results. The novel technique combines the advantages of a low recurrence rate of the posterior bone block with the reduced posteroinferior glenohumeral translation of the capsular reconstruction.

## REFERENCES

1. Provencher MT, LeClere LE, King S, et al. Posterior instability of the shoulder: Diagnosis and management. *Am J Sports Med* 2011;39:874-886.
2. Van Tongel A, Karelse A, Berghs B, Verdonk R, De Wilde L. Posterior shoulder instability: Current concepts review. *Knee Surg Sports Traumatol Arthrosc* 2011;19:1547-1553.
3. Sirveaux F, Leroux J, Roche O, Gosselin O, De Gasperi M, Molé D. Surgical treatment of posterior instability of the shoulder joint using an iliac bone block or an acromial pediculated bone block: Outcome in eighteen patients. *Rev Chir Orthop Reparatrice Appar Mot* 2004;90:411-419 (in French).
4. Barbier O, Ollat D, Marchaland JP, Versier G. Iliac bone-block autograft for posterior shoulder instability. *Orthop Traumatol Surg Res* 2009;95:100-107.
5. Servien E, Walch G, Cortes ZE, Edwards TB, O'Connor DP. Posterior bone block procedure for posterior shoulder instability. *Knee Surg Sports Traumatol Arthrosc* 2007;15:1130-1136.
6. Fronek J, Warren RF, Bowen M. Posterior subluxation of the glenohumeral joint. *J Bone Joint Surg Am* 1989;71:205-216.
7. Meuffels DE, Schuit H, van Biezen FC, Reijman M, Verhaar JA. The posterior bone block procedure in posterior shoulder instability: A long-term follow-up study. *J Bone Joint Surg Br* 2010;92:651-655.
8. Wellmann M, Bobrowitsch E, Khan N, et al. Biomechanical effectiveness of an arthroscopic posterior Bankart repair versus an open bone block procedure for posterior shoulder instability. *Am J Sports Med* 2011;39:796-803.
9. Lafosse L, Boyle S. Arthroscopic Latarjet procedure. *J Shoulder Elbow Surg* 2010;19:2-12 (Suppl).
10. Kim SH, Ha KI, Park JH, et al. Arthroscopic posterior labral repair and capsular shift for traumatic unidirectional recurrent posterior subluxation of the shoulder. *J Bone Joint Surg Am* 2003;85:1479-1487.